

# Investigation of Subcategories according to the Level of Job Stress in Medical Technologist

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## 임상병리사의 직무스트레스의 수준에 따른 하위영역의 실태조사

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The purpose of this study was to provide fundamental data for the plans to reduce occupational stress by analyzing occupational stress of medical technologist. The experimental group comprised of 193 medical technologists working in Gyeonggi province. Occupational stress was 49.74 out of 100. In detail, job insecurity showed a high value of 64.42, followed by organizational system, lack of reward, physical environment, job demand, insufficient job control, interpersonal conflict, and occupational climate with respective values of 52.46, 52.30, 51.18, 49.57, 48.43, 39.78 and 39.77. It is recommended that those in high-stress job group increase physical activity and reduce job insecurity to improve health. The development of programs to reduce occupational stress are necessary, and this study can provide objective information using biological indicators.

**Key words:** Medical technologist, Organizations, Reward, Stress

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## INTRODUCTION

Job stress has an effect on a person's well-being, which includes cognitive, psychological, physiological, and behavioral aspects. According to the US National Institute for Occupational Safety and Health [1,2], job stress can be defined as the harmful physical and emotional responses that occur when the requirements of a job do not match the capabilities, resources, or needs of a worker. Health-care workers in hospitals are exposed to high levels of

occupational stress resulting from heavy workload, extended working hours and high levels of time pressure. Hospital staff members, including physicians and nurses, have higher risk of suffering from depressive disorders compared to the general population [3]. Higher levels of workplace stress are associated with higher levels of depression and anxiety, as well as lower levels of resiliency, job satisfaction, and healthy lifestyle beliefs. This suggests development of intervention programs that focus on education and skills-building in health

promoting behaviors, including emotional regulation of stress, anxiety and depression [4].

In terms of workplace type, half-day shift did not cause any significant change of fixed biorhythm in nurses. Cortisol and NK cell activity levels were low during night shift, suggesting that night shift itself involved high stress level, which is prejudicial to biodefense [5]. Accumulated job stress is a mechanism that increases the risk of health status by losing the balance of autonomic nervous system, immune function, and endocrine function. Most studies are limited to exploring correlation of job stress and ignore the affecting factors. The results of this study can help hospital managers develop solutions to job stress of medical technologists (also called medical laboratory technologist, medical laboratory scientist, clinical laboratory technologist, or clinical laboratory scientist). Increased workload among clinical laboratory scientists, growing job stress and declining job satisfaction are major concerns of laboratory managers and unit educators. This study examined the association of job stress of medical technologists.

## MATERIALS AND METHODS

### 1. Study design

This is a descriptive correlation study attempting to grasp the level of job stress among medical technologists and to verify predictor variables of incidents.

### 2. Sample and setting

Data were collected by administering an internet questionnaire via visit from May to July 2014. This study was approved by the institutional review board of University (140428-2). The purpose of this study was explained to subjects during the visit, and the questionnaire was administered after obtaining their consent. All subjects agreed to participate in this study and responded to the survey questionnaire in Gyeonggi province medical technologists. A total of 193 subjects, excluding one subject with an inadequate response, were ultimately included in this investigation. Number of

participants was calculated using G-Power 3.1.3, which is a program that estimates sample size. Minimum sample size required was calculated in unit of person, with significance level of 0.05, effect size of 0.10, and power of 0.8 for 28 independent variables. The questionnaire consisted of questions assessing general characteristics, job stress.

### 3. Job stress

Job stress was measured using short form of the Korean Occupational Stress Scale (SF-KOSS) developed by Chang et al [6], including the "physical environment" sphere for KOSS. This tool included 8 subcategories and 43 question items: Physical environment (N=3), job demand (N=8), insufficient job control (N=5), interpersonal conflict (N=4), job insecurity (N=6), organizational system (N=7), lack of reward (N=6), and occupational climate (N=4).

For each item, job stress was measured on a four-point Likert scale: Strongly disagree (1), disagree (2), agree (3), and strongly agree (4) with inverse conversion for positive items. Job stress points were calculated by converting them into 100-point marks by subarea, where higher scores indicate greater job stress. Cronbach's  $\alpha$  of SF-KOSS was 0.633 in this study.

$$\text{Score of subcategory} = \frac{(\text{actual score} - \text{number of questions}) \times 100}{\text{predicted top score possible} - \text{number of questions}}$$

$$\text{Total score of job stress} = \frac{\text{total amount of independent 8 subcategories}}{8}$$

### 4. Data analysis

Frequency, percentage, mean, standard deviation, median and range were used to reveal general characteristics and job stress. Data were analyzed using SPSS Statistics 18. General characteristics, job stress of the subjects were analyzed with descriptive statistics including frequency, percentage, mean, standard deviation, etc. To determine the correlation among general characteristics of the subjects, the ANOVA was performed. levels of job stress were analyzed by differences in general characteristics of the subjects using the Scheffe test or post hoc

comparison. and the distribution of sub-categories according to job stress level (low, middle, high) was examined. Reliability of the tool was analyzed by Cronbach's  $\alpha$  with significance level of 0.05. The correlation between job stress was analyzed using Pearson correlation coefficients.

## RESULTS

### 1. General characteristics of subjects

General characteristics of the subjects are shown in Table 1. Mean age of 193 subjects was 35.3 years old. One hundred thirty-six subjects (71.5%) were over age of 30 years, and 101 subjects (52.3%) were women. Among the subjects, 37.3% had religion. For clinical experience, most

of the subjects (51.8%) had over 10 years of experience. With regards to position, most of the subjects were registered general clinical laboratory scientists (63.2%), with 85% working full-time. For type of institution, most of the subjects (56.0%) worked at a general hospital. One hundred and five subjects (54.4%) had occasional fatigue.

### 2. Scores for job stress

Mean score for job stress was  $49.74 \pm 5.05$  points with a minimum of 36.07 points and a maximum of 71.58 points. Looking at mean scores of 8 subcategories of subordinate factors of occupational stress, score for high job insecurity was  $64.42 \pm 12.06$  points,  $52.46 \pm 15.20$  points for organizational system,  $52.30 \pm 11.95$  points for lack of reward,  $49.57 \pm 12.34$  points for job demand,  $48.43 \pm 11.93$  points for insufficient job control, and  $39.77 \pm 16.01$  point for low occupational climate (Table 2).

**Table 1.** General characteristics of the study participants (N=193)

Characteristics	Categories	N	%	
Age	mean $\pm$ SD	35.28 $\pm$ 8.13		
	20~24	11	5.7	
	25~29	46	23.8	
	30~34	36	18.7	
	35~39	36	18.7	
	40~44	38	19.7	
	45~49	15	7.8	
Gender	>50	11	5.7	
	Male	92	47.7	
Religion	Female	101	52.3	
	Yes	72	37.3	
Work unit	No	121	62.7	
	Collection	23	11.9	
	Hematology	15	7.8	
	Chemistry	38	19.7	
	Microbiology	21	10.9	
	Immunology	26	13.5	
	Pathology	23	11.9	
	Molecular diagnostic	9	4.7	
	Blood bank	18	9.3	
	Cardiovascular	4	2.1	
	Neuromuscular	5	2.6	
	Health management	3	1.6	
	General physiology	2	1.0	
	Others (included infection)	6	3.1	
	Educational level	College	107	55.4
		University	64	33.2
>Graduate school		22	11.4	
Type of work	Full time	164	85.0	
	3 shift	6	3.1	
	Other (only night)	23	11.9	
Average of night work days per month	2.29 $\pm$ 1.24			
	1~2	149	77.2	
	3~4	19	9.8	
	>5	25	13.0	

**Table 1.** Continued

Characteristic	Categories	N	%
Special certificate board (domestic)	Yes	75	38.9
	No	118	61.1
Type of work institution (No. of beds)	<100	3	1.6
	100~200	6	3.1
Drinking	General hospital	108	56.0
	University hospital	74	38.3
	Clinical laboratory center	2	1.0
	None	19	9.8
Smoking	<1 per month	50	25.9
	>1 per month	73	37.8
	>1 per week	51	26.4
Snack	Daily	32	16.6
	Frequently	10	5.2
	Quit smoking	21	10.9
Previous disease	None	130	67.3
	None	8	4.1
	Sometimes	124	64.2
	Frequently	55	28.5
Previous therapy for disease	Very often	6	3.1
	Yes	40	20.7
Chronic disease	No	153	79.3
	Yes	42	21.8
Existing drug	No	151	78.2
	Yes	31	16.1
Fatigue	No	162	83.9
	Yes	20	10.4
	No	173	89.6
	None	6	3.1
Always	Sometimes	105	54.4
	Oftens	63	32.6
	Always	19	9.8

**Table 2.** Mean score of job stress subcategories factors (N=193)

Categories	Mean±SD
Total	49.74±5.05
Physical environment	51.18±13.19
Job demand	49.57±12.34
Insufficient job control	48.43±11.93
Interpersonal conflict	39.78±9.33
Job insecurity	64.42±12.06
Organizational system	52.46±15.20
Lack of reward	52.30±11.95
Occupational climate	39.77±16.01

### 3. Job stress according to third percentile

Table 3 shows mean score for job stress according to three-one percentile distributed groups. These three group had low, medium and high job stress scores. These job score were 44.44, 49.70 and 55.06, respectively. The results of the survey indicated a statistically significant difference among the three groups (F=263.053,  $p < 0.001$ ). Whereas there were no significant differences in occupational climate, significant differences were found in physical environment, job demand and insufficient job control. High-stress group was higher than other groups

**Table 3.** Mean score for job stress according to third percentile (N=193)

Variable	Low <sup>†</sup> (N=64) Mean±SD	Middle <sup>‡</sup> (N=65) Mean±SD	High <sup>§</sup> (N=64) Mean±SD	F (p)	Scheffe
Total	44.44±2.82	49.70±1.02	55.06±3.41	263.053 (0.000)	† < ‡ < §
Physical environment	44.44±11.88	50.09±10.04	59.03±13.41	24.664 (0.000)	† < §, ‡ < §
Job demand	44.60±9.64	48.40±10.97	55.73±13.64	15.413 (0.000)	† < §, ‡ < §
Insufficient job control	42.40±10.78	48.31±9.72	54.58±12.16	19.906 (0.000)	† < §, ‡ < §
Interpersonal conflict	35.33±9.36	40.77±8.41	43.23±8.60	13.524 (0.000)	† < ‡, ‡ < §
Job insecurity	59.38±11.74	65.38±10.02	68.49±12.73	10.321 (0.000)	† < §
Organizational system	45.16±14.52	52.60±13.35	59.60±14.50	16.703 (0.000)	† < ‡ < §
Lack of reward	46.61±11.82	53.00±9.58	57.29±12.08	14.708 (0.000)	† < ‡, ‡ < §
Occupational climate	37.63±15.78	39.10±13.58	42.58±18.31	1.615 (0.202)	

Possible range=1~100.

**Table 4.** Job stress according to general characteristic (N=193)

Characteristics	Categories	Job stress			
		Mean±SD	F	p	Scheffe
Age	20~24 <sup>†</sup>	51.89±5.21	3.170	0.006	> **
	25~29 <sup>‡</sup>	50.55±4.11			
	30~34 <sup>§</sup>	49.36±4.61			
	35~39 <sup>  </sup>	51.29±5.81			
	40~44 <sup>¶</sup>	48.84±5.19			
	45~49 <sup>#</sup>	48.47±4.07			
	>50 <sup>**</sup>	45.18±5.23			
Career length	<1	51.20±4.65	2.220	0.068	
	1~3	50.86±3.88			
	3~5	52.33±6.89			
	5~10	49.62±5.41			
	>10	48.91±4.91			
Type of work	Full time <sup>†</sup>	49.63±4.90	3.930	0.021	† < ‡, ‡ > §
	3 shift <sup>‡</sup>	55.27±9.23			
	Other (only night) <sup>§</sup>	49.08±4.11			
Type of work institution (No. of beds)	<100	53.64±15.54	2.376	0.054	
	100~200	50.30±5.65			
	General hospital	48.93±4.58			
	University hospital	50.56±4.95			
	Medical labcenter	55.58±0.40			

**Table 5.** Correlation of subcategory and job stress score ( $r$  ( $p$ ))

Variable	A	B	C	D	E	F	G
Job stress score	1						
Interpersonal relation	.113 (0.119)	1					
Nutrition	.017 (0.815)	.441* (0.000)	1				
Health responsibility	.256* (0.000)	.570* (0.000)	.565* (0.000)	1			
Physical activity	.136 (0.060)	.409* (0.000)	.416* (0.000)	.479* (0.000)	1		
Stress management	.180 <sup>§</sup> (0.012)	.665* (0.000)	.458* (0.000)	.609* (0.000)	.609* (0.000)	1	
Spiritual growth	.171 <sup>§</sup> (0.018)	.711* (0.000)	.507* (0.000)	.553* (0.000)	.422* (0.000)	.665* (0.000)	1

\* $p < 0.01$ ; <sup>§</sup> $p < 0.05$ .

A, Job stress score; B, Interpersonal relation; C, Nutrition; D, Health responsibility; E, Physical activity; F, Stress management; G, Spiritual growth.

(low-stress group and medium-stress group) ( $p < 0.001$ ). There were significant differences in lack of reward and interpersonal conflict between low-stress group and medium or high-stress group ( $p < 0.001$ ). There was significant difference in job insecurity between low stress group and high stress group ( $p < 0.001$ ). There was significant difference in organization system between low and middle groups than high stress group ( $p < 0.001$ ).

#### 4. General characteristics of job stress

Table 4 shows job stress according to general characteristics. The majority factors of general characteristics showed no significance in job stress. However, age and type of work showed significant difference in general characteristics. In particular, age of 35~39 years was significantly different from age of 50 years ( $p < 0.006$ ). Type of work showed significant difference between 3-shift and full-time or other group (only night) ( $p < 0.021$ ). No significance of career length and type of work institution.

#### 5. Correlation of job stress included subcategory

Six subcategories of job stress showed a significant positive correlation with job stress scores. For job stress, health responsibility, stress management and spiritual growth were significant correlation (Table 5).

## DISCUSSION

This population-based wild study was the first to examine the level of job stress of medical technologist and

the developed SF-KOSS instrument using by reported. In addition, we used research tool with high reliability and validity as a job stress tool that can be commonly encountered in workers in Korea, and it reflects the actual situation of medical technologists working environment. Better performance in or higher frequency of health-promoting life-style behaviors might reduce the chances of developing stress-related symptoms. Kim and Kim reported average job stress score of 51.41, with average of top 25% of the subjects (high level of stress) being 59 and average of subjects low level of stress being 43, in clinical nurses [7]. Job stress does not affect lower self-efficacy of hospital nurses [8]. In medical care, employees with lower degree of autonomy, self-efficacy and authority to influence job content had highest overall physical exposure levels [9]. Clear work tasks, positive feedback, physically non-strenuous work, self-rated health and leisure time factors were found be important for high work ability [10]. Self-efficacy, personal safety and musculoskeletal well-being were important for medical workers, while work ability of care aides was associated with safety climate and also with non-changeable factors of age and seniority. Proactive workplace interventions need to focus on potentially modifiable factors such as self-efficacy, safety climate, physical job demands and musculoskeletal well-being [11]. In order to settle down clinical trial in the field of laboratory, intervention to relieve stress of person and resolving problems in salary, job description and administration are necessary. Also, professional training programs and human resource systems that improve job satisfaction are needed. Previously, In biomarker with job stress study,

immune factors related to job stress affected health status variable. Job (dis)satisfaction was related to psychological mechanisms in stress affecting cellular immune function [12]. For correlations between biochemical and immunological variables analyzed by Pearson coefficients, reduction of NK CD57 and IL-6 contents better characterizes occupational satisfaction [13]. Work stress is related to elevated stress responses of HPA (hypothalamus-pituitary-adrenal) axis biomarkers [14]. Urinary IL-8 might be an appropriate biomarker for stress assessment [15]. Therefore, it is necessary to identify the biomarkers and the job stress in medical technologists.

Anxiety and job insecurity (greater than occupational stress) reduce NK cell activity, thus affecting health lifestyle [16,17]. The majority of psychological and physical stress indicators result from individual- environment interaction [18]. Generally, both dimensions of job satisfaction and manifestations of occupational stress are relevant predictors of burnout syndrome [19]. As a result of analyzing the factors related to subcategories of job stress, interpersonal relationship, nutrition and physical activity did not affect the total score of job stress, but health responsibility, stress management, spiritual growth showed statistically significant increase. This is thought to be a part of the work environment of the medical technologists, and the factors required for health promoting behaviors impacts. Among job stress factors, only job instability and lack of job autonomy are found to be factors having a significant effect on accidents. However, factors showing significant correlation with cognitive failure turn out to be physical environment, lack of job autonomy, relational conflict, organizational system, improper reward and work culture, which are subcategories of job stress. This suggests that job stress factors can have an indirect effect on accidents through cognitive failure. Thus, future research needs to cover structural equation modeling to examine direct and indirect effects of job stress on accidents using cognitive failure [20]. Previously, Awareness on the part of medical technologists were stress and the harm it can cause. Increased awareness caused by the less stressful working environments and an improved quality

of laboratory life for human health [21]. Also, health-related behavior factors, job-related factors and job satisfaction were influenced by significant related variables affecting the level of burnout in medical technologist [22].

This study reveals that job stress are important factors related to medical technologist. Conclusively, the results suggest that it would be necessary to develop various programs to improve health-promoting behavior and job satisfaction. Special role and improper treatment of job stress were correlated with salary, technical level and administrative satisfaction, except for correlation of medical people with job satisfaction. Based on the results of this study, to reduce job stress, to enhance job satisfaction of medical technologist and to solve health conditions and efforts of health, it is necessary to develop and apply plans for administrative support and arbitration programs. Educational programs should be devised to promote healthy lifestyle and also to achieve early detection and appropriate intervention.

## 요 약

본 연구는 임상병리사를 대상으로 직무스트레스의 정도를 파악하고, 이들 간의 상관성을 규명함으로써 직무스트레스의 감소를 위해 건강을 높일 수 있는 방안을 마련하는데 기초자료를 제공하고자 수행한 서술적 조사 연구이다. 임상병리사의 직무스트레스는 최대 100점에 49.74점으로 나타났고, 하부영역 별로 직무불안정이 64.42점으로 가장 높았고, 조직체계가 52.46점, 보상부적절이 52.30점, 물리적환경이 51.15점, 직무요구도는 49.57점, 직무자율성결여는 48.43점, 관계갈등은 39.78점 순이었고, 직장문화는 39.77점으로 가장 낮게 나타났다. 본 연구결과를 통해 임상병리사의 직무스트레스에 관련한 요인들의 상관성을 확인하였고 직무스트레스가 높은 군에서는 직무불안정을 감소시키고 건강증진에서의 신체활동을 증가시키는 활동이 요구되고, 이를 통해 직무스트레스 감소를 위해 절실한 프로그램의 개발이 요구되고, 건강상태 인자에 대한 정보를 향후 조사해야 할 것으로 사료된다.

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